sensing pixels **311** illustrated in FIG. **4** are disposed on an insulation portion **313** having mutual ductility and insulation characteristics. The insulation portion **313** may include rubber, polymer, paper, and natural and synthetic fibers. For example, the plurality of sensing pixels **311** may be attached to latex rubber. The sensing pixels **311** independently move from an electric force or a magnetic force of a lower portion, so that a user can be provided with more precise tactile feedback. The sensing pixels **311** may use a metal including Au, Al, Fe, Ag and Pt, a transparent electrode material including ITO, IZO, etc. to provide an electrostatic force, or a permanent magnet to provide a magnetic force. Furthermore, the sensing pixels **311** may be formed of a metallic permanent magnet to provide both the electric force and the magnetic force, or a multi-layer, in which a material providing an electrostatic force and a material providing a magnetic force are stacked.

[0029] An active-driving process of the tactile and visual display device having the above configuration will be described below. The processes of generating texture using the above configuration and measuring a tactile sensation are largely divided into three processes. These are a writing process in which a voltage is applied to both ends of the capacitor **217** using the transistors **214**, **215** and **216** to generate a phase difference, a sustaining process in which the charged voltage in a condenser **215** is maintained until the next writing process, and a detecting process in which the sensor **300** approaches the transparent electrode **211** to generate an electrostatic force between both electrodes.

[0030] First, a scan pulse voltage V_3, which is as large as V, is applied to the transistors **215** and **216** to turn them on. Simultaneously, a first address voltage V_1 and a second address voltage V_2 are respectively applied to the transistors **215** and **216** to generate a phase difference of $|V_1-V_2|$ at both ends of the capacitor **217**. The phase difference generated in the capacitor **217** will be used as a drive voltage that drives the tactile sensation generator **200**. After the writing process is completed, the scan pulse voltage V_3 is grounded, which is in the state of a zero phase difference, and the transistors **215** and **216** are turned off.

[0031] An inverse scan pulse voltage V_4 represents an opposite signal to the scan pulse voltage V_3. That is, when V_3 is applied as large as V, V_4 is grounded, and when V_3 is grounded, V_4 is applied as large as V.

[0032] Subsequently, in the writing process, while the transistors **215** and **216** are turned on, the transistor **214** is turned off. Also, in the sustaining process, while the transistors **215** and **216** are turned off, the transistor **214** is turned on. In this process, since the transistor **214** is turned on and V_2 is grounded, when the sensor **300** approaches the transparent electrode **211**, a closed circuit is formed among the capacitor **217**, the transparent electrode **211** and the sensor **300**, so that an electrostatic force is produced between the transparent electrode **211** and the sensor **300**. This process is the detecting process, in which an electrostatic force is generated between both electrodes, and a phase difference between the transparent electrode **211** and the sensor **300** is the same as a phase difference $|V_1-V_2|$ generated in the capacitor **217**. Further, when the sensor **300** moves in the tactile sensation generator **200**, a shear force equivalent to the multiplication of an electrostatic force and a surface friction coefficient is generated, and the value and polarity of the voltage of each corresponding pixel **201** may be adjusted over time, so that various changes in the shear force and various textures may be obtained.

[0033] Referring to FIG. **2**, the tactile sensation generator **200** of the tactile and visual display device according to the present invention may produce coil-shaped current to generate a magnetostatic force, and may generate a force using the magnetization of the sensor **300**. For example, when a voltage is applied to a gate electrode of the field effect transistors **5**, **7**, **8**, **9**, **11**, **12**, **13**, **14**, **16**, **18**, **21**, **22**, **23** and **24** that connect the adjacent corresponding pixels **201** of the tactile sensation generator **200**, each transistor corresponding to its reference numeral is turned on, so that current that rotates twice is induced. Referring to FIG. **2***a*, a transistor to which a voltage is applied becomes a conductor, in which current can flow, and a transistor to which a voltage is not applied becomes an insulator, in which current cannot flow, so that the current appears to rotate twice when viewed from the center of the drawing, i.e., appears to flow in the form of swirl from a positive (+) voltage to a negative (−) voltage. The method of driving the tactile and visual display device may produce a coil-shaped current whose number of rotations can be controlled.

[0034] The tactile sensation generator **200** is formed of a multilayer, in which a portion generating an electric field and a portion generating a magnetic field are formed, to simultaneously use an electric field and a magnetic field. When each of the sensing pixels **311** of the pad portion **310** is formed of a conductive material to sense an electric force, the portion generating an electric field in the tactile sensation generator **200** may provide height information. When the sensor **300** maintains a positive (+) voltage, a positive voltage (+) is applied to a protruding portion of an image displayed on the tactile sensation generator **200** and a negative voltage is applied to a recessed portion of the image to display the protruding and recessed portions of the image on the display unit **100**, a force outwardly directed from the display is applied to the protruding portion of the image, and a force inwardly directed from the display is applied to the recessed portion of the image in the sensor **300**, so that a user can perceive bumps and creases as well as a visual image.

[0035] When each sensing pixel **311** of the pad portion **310** is formed of a magnetic material to sense a magnetic force, the tactile sensation generator **200** may also use a magnetic field. The tactile sensation generator **200** may use both a static magnetic field and an induced magnetic field among the magnetic fields generated in a circuit. The static magnetic field can provide height information like the electrostatic force, so that a user can perceive bumps and creases. Meanwhile, the induced magnetic field can provide a frictional force, elasticity and viscosity. That is, the tactile sensation generator **200** can represent overall highs and lows by a magnetic force, and detailed highs and lows by an electric force to broaden the representation.

[0036] When current flows into the tactile sensation generator **200** to form a magnetic force, according to Lenz's law, the farther away a magnet is, the greater the current, so that the sensor **300** is drawn in. Using this phenomenon, when the sensor **300** formed of a magnetic material moves parallel to the tactile sensation generator **200**, the movement is resisted by a induced magnetic field. However, when the current is adjusted to control the force that resists the movement, a frictional force may be controlled. Also, when the sensor **300** formed of a magnetic material moves perpendicular to the